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Children's Perceptions of Child-Friendly Shaped Fruit and Vegetable Snacks: are they seen as more Fun and Appealing?

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Abstract

Background

The nutrients provided by fruits and vegetables are essential for optimal growth and development, yet fruits and vegetables continue to be under-consumed by most children. Children's liking of foods is a primary predictor of intake, suggesting that increasing children's liking of fruits and vegetables may serve as an initial step toward increasing their consumption. The objective of this study was to determine if healthy fruit and vegetable (FV) snacks presented in child-friendly (CF) shapes were perceived as more fun and therefore better liked by children, as compared to FV snacks offered in regular shapes.

Methods

Convenience sample recruited in a local shopping mall and two large grocery stores. Children (n=365) participated in a survey and both children and adults completed an optional taste-test of apples, cucumbers, cantaloupe, and sweet potatoes offered either in regular shapes (small chunks and slices) or in CF shapes (butterfly, chick, flower and teddy bear).

Results

Data indicated that CF-shaped FV snack samples were 34.2% more likely to be selected than their regular-shaped versions (OR 1.342, 95% CI 1.024 – 1.760, p<0.033). Children perceived the shape of CF-shaped fruits and vegetables as more fun than that of regular-shaped fruits and vegetables (p<0.001). Children's ratings of the appearance, taste and texture of the FV snacks were high, (lsmean ± SE ≥4.35 ± 0.08) but ratings were not significantly different between CF- and regular-shaped samples.

Conclusions: Results suggest that the shape of FV snacks may play a role in children's perception of these foods as being "fun" and may encourage children to try (and eat) those foods; however, future research is needed to explore the size, color, and shapes that are most likely to also increase the liking and consumption of healthy snack foods, such as fruits and vegetables.

Keywords: Fun-Shaped Foods; Fruit and Vegetable Intake, Snacks

Introduction

Many fruits and vegetables are nutrient-dense foods – low in fat and calories, but rich in vitamins, minerals, fiber and phytonutrients [1, 2]. These nutrients are especially important for healthy growth and development during childhood, when nutrient needs are high relative to total caloric intake [3]. Measures of diet quality such as the Healthy Eating Index (HEI) reveal that children have low intake scores for both of these food groups, with the exception of fruit during the preschool years [4]. The prevalence of adequate fruit and vegetable (FV) consumption among U.S. children typically decreases with age; less than 14% of adolescents meet the minimum recommended daily levels of fruit intake and as little as 3% achieve the minimum intake recommendations for vegetables [5]. Because dietary intake patterns track through childhood and adolescence into young adulthood [6, 7], public health efforts to increase FV

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intake would likely have the greatest impact when implemented early in life.

Asserting pressure on children to eat healthful foods has been shown to be ineffective and may result in lower FV consumption and the development of picky eating habits [8]. Less forceful approaches, such as making fruits and vegetables more available and accessible (i.e. serving cut-up versus whole produce) have been shown to increase intake, particularly among children who have an established low preference for fruits and vegetables [8, 9]. Additional factors of FV consumption include: age, sex, socio-economic status (SES), effort (i.e. time required for FV preparation), and the sensory properties of fruits and vegetables (i.e. aesthetics, presentation, smell, taste and texture) [10, 11]. Typically, younger children, girls, and children from higher SES households consume higher levels of FV [11].

Successful appearance-focused efforts to increase the appeal of foods among children include offering foods in child-friendly (CF) shapes. For example, Olsen et al. (2012) reported that children preferred pictures of star-shaped over regular-shaped vegetables [12] and Jansen et al. (2010) found that children's consumption of novel, visually appealing fresh fruit arrangements was nearly 85% higher than consumption of the same fruits when they were offered in the usual style [13]. However, results are not consistent, as others suggest that providing snack foods in "cute" (vs. standard) shapes does not increase the amount of food consumed [14, 15].

To date, there are a scarcity of data on children's acceptance and liking of fun, healthy FV snacks [12, 13]. The objective of this study was to determine if healthy FV snack samples presented in CF shapes were perceived as more fun and were better liked by children (compared to the same foods being offered in regular shapes, such as cubed or sliced). To pursue this objective, data were collected to explore whether children would elect to try (and eat) a greater percentage of CF-shaped FV samples and if children would report higher ratings of "fun", appearance, taste, and texture of the CF-shaped FV samples.

Methods

Study Sample

A convenience sample of participants was recruited at a shopping mall and two large supermarkets in an urban location in northwestern Indiana. A research station was set up next to the children's play area in the shopping mall and at the entrance to the produce department in the grocery stores. Any child who demonstrated interest in the research station and who was accompanied by an assenting adult was invited to participate, if they wished to do so. Parents and caregivers were invited to participate as well (results published elsewhere [16]).

Each research station consisted of a table that housed two interviewing areas equipped with laptop computers, Likert-type facial descriptor response scales for children to help them respond to the survey questions, samples of the study foods, as well as colorful stickers which were offered as compensation for participation in the study. Since no personal information or personally identifiable data were collected, this study was determined to be exempt from review by the Institutional Review Board.

Survey Design

A web-based Qualtrics® survey containing "yes/no" questions and Likert-type facial descriptor response scales was developed and administered at sites with Wi-Fi Internet access, an identically worded paper-version of the survey was used at sites without Internet access.

The Likert-type facial descriptor response scales consisted of five facial descriptors (faces) representing a scale ranging from "not at all" to "very/very much". The facial descriptor modification of Likert-type scales has been used extensively as an age-appropriate tool in research on children's liking of and preference for food [17, 18]. The statements on the survey were read aloud to the children, who indicated their responses both verbally and/or by pointing to a paper copy of the five-point scale; responses were recorded by the research staff. Current level of hunger; child's general liking of foods with fun shapes (examples given were goldfish- and bear-shaped crackers, dinosaur-shaped chicken nuggets, etc.), child's perception of the food samples as being "fun" shape; and rating (visually or by taste-test) of the appearance, taste, and texture of the samples were recorded using the five-point scale.

The questions about the FV snacks for children choosing to taste-test the snacks were "I like foods that have fun shapes", "This food has a fun shape", "The food looked good" (appearance), "The food tasted good" (taste), The food felt good in my mouth" (texture). For children not wanting to taste the food, the questions were "The food looks like something I would like to eat, but not right now" (visual, liking), "The food looks like it would taste good" (visual, appearance), "The food looks like it would taste good" (visual, taste), "The food looks like it would feel good in my mouth" (visual, texture).

Time of last meal eaten was reported by the parents and recorded in hours and minutes; child's sex was recorded as boy or girl and weight category was estimated using visual comparison scales, however, since estimated body weight category of the child was deemed not reliable information (due to variations in clothing and ability to assign children to one of the possible nine body shapes, ranging from very thin to extremely obese), those data were not analyzed.

All researchers involved in the data collection were trained prior to the start of data collection to ensure adherence to standard protocols and language for administering the questionnaire to limit interviewer-based bias. Data collection was conducted morning, midday and evening on weekdays (n=14) and weekend days (n=11).

Study Foods

Study foods were selected based on size, shape, and textural properties, to allow the shaping of the foods using cookie cutters, and by color – white (Fuji apples, cucumbers) and orange (cantaloupe, sweet potatoes). Foods were either peeled and cut into bite-sized rectangular pieces (apple, cantaloupe), slices (cucumber),

or quartered slices (sweet potato) or peeled, sliced and cut into CF shapes using small, commercially available cookie cutters. In direct communication with study participants, CF shaped items were referred to as "fun shaped". Four shapes that were likely to appeal to children were selected based on previous research using child-friendly shaped foods in a preschool setting [14]: a butterfly, chick, flower and teddy bear. Sweet potatoes were steamed or baked in a small amount of water; all other foods were served raw. Ball® Fruit Fresh® Produce Protector (ascorbic acid) was applied to the apple samples to prevent enzymatic browning and to maintain color.

One of four possible shape and color combinations of the sample foods was randomly selected for each study day: a) regular-shaped white foods, b) CF-shaped white foods, c) regular-shaped orange foods, or d) CF-shaped orange foods (photographs of foods available upon request).

The food items were kept in coolers to prevent spoiling and offered to participants as an optional taste-test to all children who completed the survey. If participants declined the taste-test they were asked to visually rank the foods' attributes. Children's refusal to participate in the study or answer any or all of the survey questions was honored. The number of food items offered to participants and the number of uneaten samples that were discarded were recorded daily by food type and shape. These data were then used to estimate the desirability of the study foods.

Statistical Analysis

Descriptive statistics to describe the sample population were generated. Statistical analysis was performed using Statistical Analysis Software (SAS Version 9.3, 2010, SAS Institute Inc., Cary, NC). Both survey types (paper and electronic) were collected at the shopping mall, paper surveys were collected at the grocery locations. To include a possible variation in the responses due to the location or the survey type, a three-level variable indicating survey type/location (paper/mall, electronic/mall, and grocery) was created and included in the statistical model (to control for possible confounding). Data were analyzed in aggregate.

Differences in the likelihood of selecting a sample when the food was CF vs. regular shape were estimated using logistic regression contrasts. Analysis of variance (ANOVA) was used to assess the influence of sample shape and participant sex on perceptions regarding food shape. Sensory ratings of CF- and regular-shaped foods were analyzed using an ANOVA model including survey type/location and sex as covariates. The central limit theorem allows the use of parametric tests for highly skewed data, provided that the sample size is large [19]. Self-reported hunger level was not significant and was therefore not included in the model. Statistical significance was assumed at $p<0.05$.

Table 1: Characteristics of children participating in the study (in %)

Participant Characteristics	Children (n=365)
Sex	
Male	42.5
Female	56.7
Tasted Sample Food/s	
Yes	98.9
No	1.1
Data Collection Location	
Shopping Mall	69.6
Grocery Store	30.4
Survey Type	
Electronic	46.3
Paper	53.7

Results

A total of 365 children (56.7% girls) participated in the survey (Table 1). The majority of children (98.9%) tasted at least one of the sample foods prior to providing sensory ratings and the remaining 1.1% (n=4) who did not taste the samples visually rated the sensory properties of the foods. Approximately two thirds of all surveys (69.6%) were collected at the mall and 46.3% of surveys were administered electronically.

On days when CF-shaped samples were offered, the odds that the participant wanted to taste test were 34.2% higher than when the regular-shaped samples were offered (OR 1.342, 95% CI 1.024 – 1.760, p=0.033). Participants more frequently selected fruits than vegetables. There were no significant differences in selection frequency for any of the five shapes (butterfly, chick, flower, teddy bear).

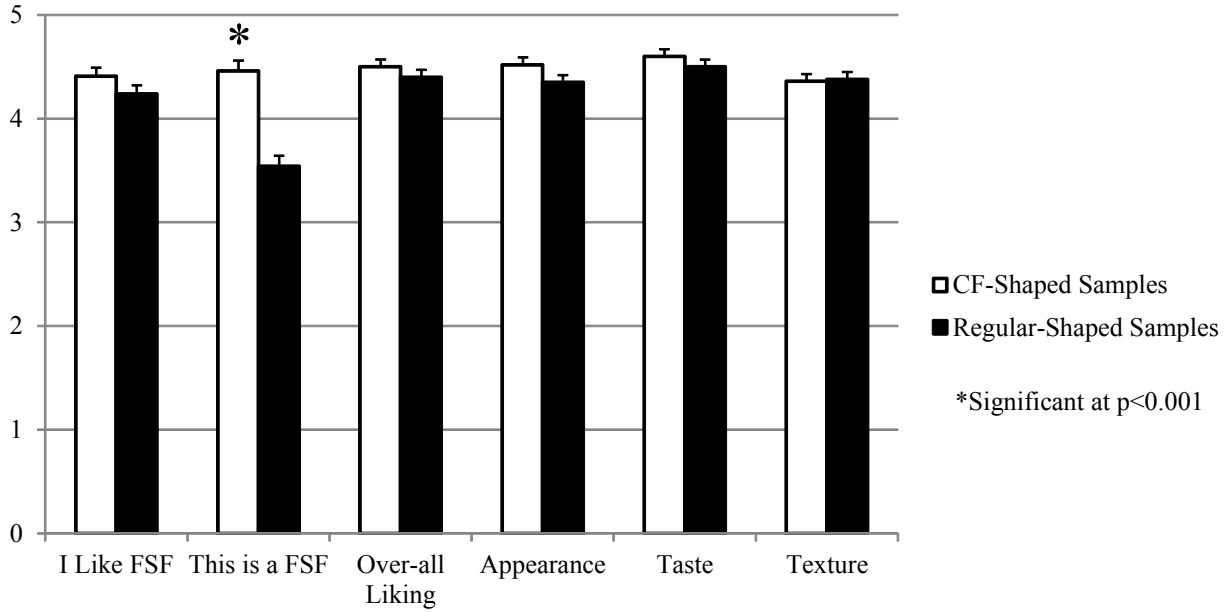
Children reported a high level of liking for "fun-shaped foods" in general (Figure 1). Average reported liking of fun-shaped foods did not vary significantly between CF- and regular-shaped foods (lsmean ± SE: 4.41 ± 0.08 and 4.24 ± 0.08, respectively). Children's mean rating of "how fun" they perceived the food shapes was higher when CF-shaped foods were offered (lsmean ± SE: 4.46 ±0.10) compared to regular-shaped foods (3.54 ± 0.10, $p<0.001$). Girls reported higher ranking than boys across both CF- and regular-shaped foods ($p<0.002$).

Shape (CF vs. regular) was not a significant predictor for ratings of appearance, taste, or texture. Girls reported higher ranking of appearance (lsmean ± SE: 4.52 ± 0.08 vs. 4.35 ± 0.08, p=0.013) and taste (4.60 ± 0.08 vs. 4.50 ± 0.08, p=0.032) and child's sex approached significance for texture ratings (p=0.066). The Likert-type sensory scale combining appearance, taste, and texture ratings showed no significant differences between children's ratings of CF-shaped (lsmean ± SE: 4.50 ± 0.07) and regular-shaped foods (4.40 ± 0.07); however, girls assigned higher mean scale scores for both CF- and regular-shaped foods as compared to boys (p=0.008).

Discussion

Results of this study suggest that children perceived the CF-shaped FV snacks as being more "fun" than regular-shaped FV snacks. Also, CF-shaped foods were more likely to be selected for taste testing compared to the regular-shaped FV. Children's self-reported liking of the food's appearance, taste, and texture was not

Figure 1: Children's average responses to the survey statements, sorted by responses to child-friendly (CF) -shaped and regular-shaped samples of study foods[1-3]



[1] Response scales consisted of five facial descriptors representing an ordinal scale ranging from "not at all"=1 to "very/very much"=5

[2] Error bars represent SE

[3] FSF = Fun-shaped food (the term "fun shaped" was used in direct communication with participants when referring to child friendly (CF) shaped items)

appreciably affected by the shape of the food. These results suggest that although offering FV in CF shapes may capture children's attention (i.e. at the grocery store, in school, or at mealtimes) and encourage them to select and taste these foods, however, our data show that children did not like the CF-shaped FV better.

High preference for fruits and vegetables has repeatedly been shown to correlate with higher intake in children [18, 20, 21]. Zeinstra et al. (2007) suggested that the most important determinants of liking foods in young children were appearance and texture, while taste and understanding of health benefits of foods become more important in older children [22]. This study was designed to explore the concept of visual appeal and measure its impact on liking; however, no differences in children's liking (i.e. sensory ratings) of the CF- and regular-shaped foods were observed. Participants did report that the CF-shaped foods were perceived as more fun, which one may expect to result in increased FV intake, even in the absence of reported differences in liking. As Jansen et al. (2010) reported, offering fresh fruit in a novel, visually appealing presentation increased children's intake by almost 85%, independent of earlier taste scores [13]. The duration of this positive "novelty effect" must be investigated further to determine if it could result in sustained increased FV consumption.

Participants' responses regarding their general preference for the CF-shaped foods and their overall liking of the samples were differentially distributed by the children's sex. Jaramillo et al. (2006) reported similar results in that preschool-age boys expressed lower overall preference for 11 familiar fruits as compared to girls [17]; these findings were echoed in older children [23]. Furthermore, although only shapes with predictably high appeal were selected [24], it is possible that girls felt a higher attraction to these shapes than boys, who might have responded more strongly to the shapes of their favorite toys or super-heroes.

Although the frequency of snack consumption has increased over the past 40 years [25], very little of the total daily quantity of FV consumed by Americans is eaten as snacks [26]. According to the Produce for Better Health Foundation, only 1% of vegetables are consumed as snacks (66% are eaten at dinner) and although fruit intake is more evenly distributed across eating occasions, snacks still only account for 15% of total fruit intake [26]. Thus, convenient and appealing FV snacks could potentially increase the total FV consumption significantly, if they could be added to the diet without replacing the FV consumed at meal time.

As all studies, this study too has strengths and weaknesses. Strengths of this study include the large number of participants and the use of a variety of fruits and vegetables, which allowed results to be applied to two food groups, rather than to individual foods. One potential limitation of the current study is that participant age was not recorded. The objective of this study was, however, to establish

children's general interest in CF-shaped fruits and vegetables prior to examining marketing methods targeted to specific age groups. A second limitation was that the mode of data collection chosen did not allow differentiation between the specific shapes of the samples. Although that approach would have allowed the researchers to draw conclusions about the most liked shape, it might have limited the number of children volunteering to taste test the foods (since the serving platters would have looked less interesting). It is noteworthy to mention that some subjects taste-tested both a fruit and a vegetable and some subjects taste-tested multiple shapes.

Conclusions

Participants were 34.2% more likely to try the offered fruit and vegetable snacks when they were presented in child-friendly shapes. Further, the shaped snacks were perceived as being more fun than the regular-shaped versions of the same foods. Future studies on the long-term effects of offering CF-shaped foods as well as research on the size, color, and specific shape preferred by children of different ages are needed, especially in settings using a wider variety of fruits and vegetables and allowing the exploration of the effect of age, weight status, socio-economic background, and ethnicity.

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Conflict of Interest: None

Approving Ethics Committee

This study was approved by the Institutional Review Board for Human Research of Purdue University.

References

1. Slavin JL, Lloyd B (2012) Health benefits of fruits and vegetables. Adv Nutr 3: 506-516. doi: 10.3945/an.112.002154.
2. Landete JM. (2013) Dietary intake of natural antioxidants: vitamins and polyphenols. Crit Rev Food Sci Nutr 53: 706-721. doi: 10.1080/10408398.2011.555018.
3. Dietary Reference Intakes: Recommended Intakes for Individuals.
4. Hiza HA, Casavale KO, Guenther PM, Davis CA (2013) Diet quality of Americans differs by age, sex, race/ethnicity, income, and education level. J Acad Nutr Diet 113: 297-306. doi: 10.1016/j.jand.2012.08.011.
5. Krebs-Smith SM, Guenther PM, Subar AF, Kirkpatrick SI, Dodd KW et al. (2010) Americans do not meet federal dietary recommendations. J Nutr 140: 1832-1838. doi: 10.3945/jn.110.124826.
6. Bjelland M, Brantsaeter AL, Haugen M, Helle Margrete Meltzer2 et al. (2013) Changes and tracking of fruit, vegetables and sugar-sweetened beverages intake from 18 months to 7 years in the Norwegian Mother and Child Cohort Study. BMC Public Health 13:793. doi: 10.1186/1471-2458-13-793.
7. Ambrosini GL, Emmett PM, Northstone K, Jebb SA (2014) Tracking a dietary pattern associated with increased adiposity in childhood and adolescence. Obesity (Silver Spring) 22: 458-465. doi: 10.1002/oby.20542.
8. Galloway AT, Fiorito L, Lee Y, LEANN L. BIRCH, (2005) Parental pressure, dietary patterns, and weight status among girls who are "picky eaters". J Am Diet Assoc 105: 541-548. doi:10.1016/j.jada.2005.01.029.
9. Cullen KW, Baranowski T, Owens E, Marsh T, Rittenberry L, (2003) Availability, accessibility, and preferences for fruit, 100% fruit juice, and vegetables influence children's dietary behavior. Health Educ Behav 30: 615-626. doi: 10.1177/1090198103257254.
10. Krolner R, Rasmussen M, Brug J, Knut-Inge Klepp, Marianne Wind et al. (2011) Determinants of fruit and vegetable consumption among children and adolescents: a review of the literature. Part II: qualitative studies. Int J Behav Nutr Phys Act 8: 112. doi: 10.1186/1479-5868-8-112.
11. Rasmussen M, Krolner R, Klepp KI, Leslie Lytle,3 Johannes Brug,4 et al. (2006) Determinants of fruit and vegetable consumption among children and adolescents: a review of the literature. Part I: Quantitative studies. Int J Behav Nutr Phys Act 3: 22. doi:10.1186/1479-5868-3-22.
12. Olsen A, Ritz C, Kramer L, Møller P et al. (2012) Serving styles of raw snack vegetables. What do children want? Appetite 59: 556-562. doi: 10.1016/j.appet.2012.07.002.
13. Jansen E, Mulkens S, Jansen A, (2010) How to promote fruit consumption in children. Visual appeal versus restriction. Appetite. 54: 599-602. doi: 10.1016/j.appet.2010.02.012.
14. Boyer LE, Laurentz S, McCabe GP, Kranz S (2012) Shape of snack foods does not predict snack intake in a sample of preschoolers: a cross-over study. Int J Behav Nutr Phys Act 9: 94. doi: 10.1186/1479-5868-9-94.
15. Branen L, Fletcher J, Hilbert L (2002) Snack consumption and waste by preschool children served "cute" versus regular snacks. J Nutr Educ Behav 34: 279-282. doi:10.1016/S1499-4046(06)60107-3.
16. Baker SB, McCabe SD, Swithers SE, Collin R. Payned, Sibylle Kranze (2015) Do healthy, child-friendly fruit and vegetable snacks appeal to consumers? A field study exploring adults' perceptions and purchase intentions. Food Qual Prefer 39: 202-208. doi:10.1016/j.foodqual.2014.07.013.
17. Jaramillo SJ, Yang SJ, Hughes SO, Fisher JO, Morales M, et al. (2006) Interactive computerized fruit and vegetable preference measure for African-American and Hispanic preschoolers. J Nutr Educ Behav 38: 352-359. doi:10.1016/j.jneb.2006.06.003.
18. Chu YL, Farmer A, Fung C, Kuhle S, Veugelers P (2013) Fruit and vegetable preferences and intake among children in Alberta. Can J Diet Pract Res 74: 21-27. doi: 10.3148/74.1.2013.21.
19. Norman G. (2010) Likert scales, levels of measurement and the "laws" of statistics. Adv Health Sci Educ Theory Pract 15: 625-632. doi: 10.1007/s10459-010-9222-y.

20. Baxter SD, Thompson WO Fourth-grade children's consumption of fruit and vegetable items available as part of school lunches is closely related to preferences. J Nutr Educ Behav 34: 166-171. doi:10.1016/S1499-4046(06)60086-9.

21. Bere E, Klepp KI (2005) Changes in accessibility and preferences predict children's future fruit and vegetable intake. Int J Behav Nutr Phys Act 2: 15. doi:10.1186/1479-5868-2-15.

22. Zeinstra GG, Koelen MA, Kok FJ, Cees de Graaf (2007) Cognitive development and children's perceptions of fruit and vegetables; a qualitative study. Int J Behav Nutr Phys Act 4: 30. doi:10.1186/1479-5868-4-30.

23. http://www.ncbi.nlm.nih.gov/pubmed/15975175

24. Bar M, Neta M (2006) Humans prefer curved visual objects. Psychol Sci 17: 645-648. doi: 10.1111/j.1467-9280.2006.01759.x.

25. Piernas C, Popkin BM (2010) Trends in snacking among U.S. children. Health Aff (Millwood) 29: 398-404. doi: 10.1377/hlthaff.2009.0666.

26. State of the plate: 2010 study on America's consumption of fruits and vegetables [http://www.pbhfoundation.org/pdfs/about/res/pbh_res/stateplate.pdf]